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MULTIDIMENSIONAL DIGITAL SIGNAL PROCESSING(U) IMPERIAL
COLL OF SCIENCE AND TECHNOLOGY LONDON (ENGLAND)
T A LANFEAR ET AL. AUG 84 DAJA45-84-C-0025

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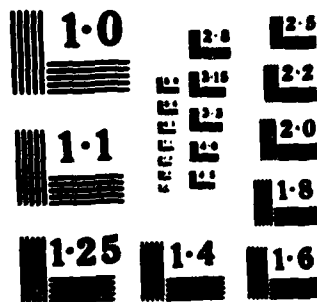
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AD-A148 055

MULTIDIMENSIONAL DIGITAL

SIGNAL PROCESSING

Final Technical Report

by

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A. G. Constantinides

August 1984

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United States Army

EUROPEAN RESEARCH OFFICE OF THE U.S. ARMY

London, England.

CONTRACT NUMBER DAJ45-84-C-0025

Imperial College of Science and Technology- A. G. Constantinides

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FORTTRAN Program Listing

Accession For

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Justification

Section/

Priority Codes

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Special

A-1

1 Introduction

This project has been concerned with the development of software tools for the study, at the most general level, of the ALPS system architecture. The primary aim of these tools is to answer such questions as: is a signal processing application feasible with a given hardware configuration?; will the system degrade gracefully if some of the resources fail?; what is the effect on system performance of changes to details such as the number of resources available, the execution time of a resource etc., etc?

2 ALPS System Simulation

A program has been written in FORTRAN 77 which simulates the ALPS Signal Flow Architecture. It takes the following information into consideration:

1. The signal processing application expressed as a signal flow graph with the modifications to this notation which have been suggested at Imperial College.
2. The number and types of resources in the system,
3. The execution time of the resources,
4. The type of resource associated with each graph node,
5. The number of data busses and their data transfer rates, *and*
6. The rate at which data is presented to the input of the system.

The simulator then steps through time examining the state of the system and modifying it appropriately so as to simulate the allocation of resources to signal flow graph nodes and the transmission of data along busses. When the state of the system changes a summary of the new system state is printed. The

information presented is:

- 1 The time.
- 2 The state of the data busses.
- 3 The number of resources unused.
- 4 The bus utilisation as a percentage of the total time.
- 5 The status of the various resources which are currently in use.

A detailed description of the program and a users manual have been given in the First and Second Interim Reports of this project. A listing of the program is appended to this report together with a floppy written in UNIX tar format containing the program and the following example.

3 An Example

Figure 1 shows a typical signal processing flow graph with two inputs (nodes 1 and 4) and a single output (node 14). Node 0 is the added input node. The prioritised inputs are marked with solid lines and the other inputs with dotted lines.

The table below gives the resource descriptions of the graph.

resource type	execution time	graph node	number
A	250	1,6,7,9	2
B	50	3,10	2
C	12	8	1
D	100	5	1
E	100	14	1
F	25	13	1
G	10	12	1
H	50	11	2
I	1	4	1
J	10	2	1
memory	0	N/A	5

The other pieces of information required are:

bus transfer time = 20

number of busses = 1

From this information the input file can be generated. It is:

```

14 11 1 20
0 2 0 0 2 0 0 0 0 0 0 0 0 0 0
0 0 2 1 0 0 0 0 0 0 2 0 0 0 0
0 0 0 2 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 2 0 0 0 0 0 0 0
0 0 0 0 0 2 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 2 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 2 0 0 0 0
0 0 0 0 0 0 0 0 2 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 2 0 0 0 2
0 0 0 0 0 0 0 0 0 0 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 2 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 2 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
250 50 12 100 100 25 10 50 1 10 0
1 10 2 9 4 1 1 3 1 2 8 7 6 5

```

- 6 -

The output obtained from this example is shown on the following pages.

NAME OF FILE TO READ INPUT DATA
GIVE I/P RATE
GIVE TIME FOR FIRST INTERRUPT

TIME IS 0
BUS 1 IS FREE

RESOURCES UNUSED
1 1 2 1 1 1 1 1 2 0 1 5

BUS UTILISATION

RES	NODE	TAG	END	MEM	NIP	SINK	NODES
1	1	0	250	0	1	2	3 10
2	4	0	1	0	1	5	

TIME IS 1
BUS 1 IS BUSY

RESOURCES UNUSED
1 1 2 1 0 1 1 1 2 1 1 5

BUS UTILISATION
100%

RES	NODE	TAG	END	MEM	NIP	SINK	NODES
1	1	0	250	0	1	2	3 10
2	5	0	121	0	1	6	

TIME IS 121
BUS 1 IS BUSY

RESOURCES UNUSED
1 0 2 1 1 1 1 1 2 1 1 5

BUS UTILISATION
17%

RES	NODE	TAG	END	MEM	NIP	SINK	NODES
1	1	0	250	0	1	2	3 10
2	6	0	391	0	1	11	

TIME IS 250
BUS 1 IS BUSY

RESOURCES UNUSED
1 1 1 1 1 1 1 1 2 1 0 4

BUS UTILISATION
16%

RES	NODE	TAG	END	MEM	NIP	SINK	NODES
2	6	0	391	0	1	11	
3	2	0	280	0	1	3	
4	10	0	999999	0	1	11	
5	1	0	270	1	1	3	

TIME IS 26
BUS 1 IS BUSY

RESOURCES UNUSED

1 1 0 1 1 1 1 1 2 1 1 4

BUS UTILISATION

21%

RES	NODE	TAG	END	MEM	NIP	SINK	NODES
2	6	0	391	0	1	11	
4	10	0	999999	0	1	11	
5	1	0	270	1	1	3	
1	3	0	999999	0	1	7	

TIME IS 300
BUS 1 IS BUSY

RESOURCES UNUSED

1 1 0 1 1 1 1 1 2 1 1 5

BUS UTILISATION

27%

RES	NODE	TAG	END	MEM	NIP	SINK	NODES
2	6	0	391	0	1	11	
4	10	0	999999	0	1	11	
1	3	0	370	0	2	7	

TIME IS 370
BUS 1 IS BUSY

RESOURCES UNUSED

1 0 1 1 1 1 1 1 2 1 1 5

BUS UTILISATION

27%

RES	NODE	TAG	END	MEM	NIP	SINK	NODES
2	6	0	391	0	1	11	
4	10	0	999999	0	1	11	
3	7	0	640	0	1	8	

TIME IS 391
BUS 1 IS BUSY

RESOURCES UNUSED

1 1 1 1 1 1 1 1 1 1 1 5

BUS UTILISATION

30%

RES	NODE	TAG	END	MEM	NIP	SINK	NODES
4	10	0	999999	0	1	11	
3	7	0	640	0	1	8	
1	11	0	999999	0	1	12	

TIME IS 640
BUS 1 IS BUSY

RESOURCES UNUSED

1 2 1 0 1 1 1 1 1 1 5

BUS UTILISATION

22%

RES	NODE	TAG	END	MEM	NIP	SINK	NODES
4	10	0	999999	0	1	11	
1	11	0	999999	0	1	12	
2	8	0	672	0	1	9	14

TIME IS 672
BUS 1 IS BUSY

RESOURCES UNUSED

1 1 1 1 1 0 1 1 1 1 5

BUS UTILISATION

23%

RES	NODE	TAG	END	MEM	NIP	SINK	NODES
4	10	0	999999	0	1	11	
1	11	0	999999	0	1	12	
3	9	0	942	0	1	10	
5	14	0	999999	0	1		

TIME IS 942
BUS 1 IS BUSY

RESOURCES UNUSED

1 2 1 1 1 0 1 1 1 1 5

BUS UTILISATION

19%

RES	NODE	TAG	END	MEM	NIP	SINK	NODES
4	10	0	1012	0	2	11	
1	11	0	999999	0	1	12	
5	14	0	999999	0	1		

TIME IS 1012
BUS 1 IS BUSY

RESOURCES UNUSED

1 2 2 1 1 0 1 1 1 1 5

BUS UTILISATION

19%

RES	NODE	TAG	END	MEM	NIP	SINK	NODES
1	11	0	1082	0	2	12	
5	14	0	999999	0	1		

BUS 1 IS BUSY

RESOURCES UNUSED

1 2 2 1 1 0 1 0 2 1 1 5

BUS UTILISATION

20%

RES	NODE	TAG	END	MEM	NIP	SINK	NODES
-----	------	-----	-----	-----	-----	------	-------

5	14	0	999990	0	1		
---	----	---	--------	---	---	--	--

2	12	0	1112	0	1	13	
---	----	---	------	---	---	----	--

TIME IS 1112

BUS 1 IS BUSY

RESOURCES UNUSED

1 2 2 1 1 0 0 1 2 1 1 5

BUS UTILISATION

21%

RES	NODE	TAG	END	MEM	NIP	SINK	NODES
-----	------	-----	-----	-----	-----	------	-------

5	14	0	999999	0	1		
---	----	---	--------	---	---	--	--

1	13	0	1157	0	1	14	
---	----	---	------	---	---	----	--

TIME IS 1157

BUS 1 IS BUSY

RESOURCES UNUSED

1 2 2 1 1 0 1 1 2 1 1 5

BUS UTILISATION

22%

RES	NODE	TAG	END	MEM	NIP	SINK	NODES
-----	------	-----	-----	-----	-----	------	-------

5	14	0	1277	0	2		
---	----	---	------	---	---	--	--

TIME IS 2000

BUS 1 IS FREE

RESOURCES UNUSED

1 1 2 1 1 1 1 1 2 0 1 5

BUS UTILISATION

14%

RES	NODE	TAG	END	MEM	NIP	SINK	NODES
-----	------	-----	-----	-----	-----	------	-------

1	1	1	2250	0	1	2 3 10	
---	---	---	------	---	---	--------	--

2	4	1	2001	0	1	5	
---	---	---	------	---	---	---	--

TIME IS 2000

WHAT DO YOU WISH TO DO?

OPTIONS ARE:

1 CHANGE INPUT RATE

2 CHANGE NUMBER OF RESOURCES IN SYSTEM

3 CHANGE EXECUTION TIME OF A RESOURCE

4 CHANGE NUMBER OF BUSES

0 STOP PROGRAM

9 CONTINUE SIMULATION

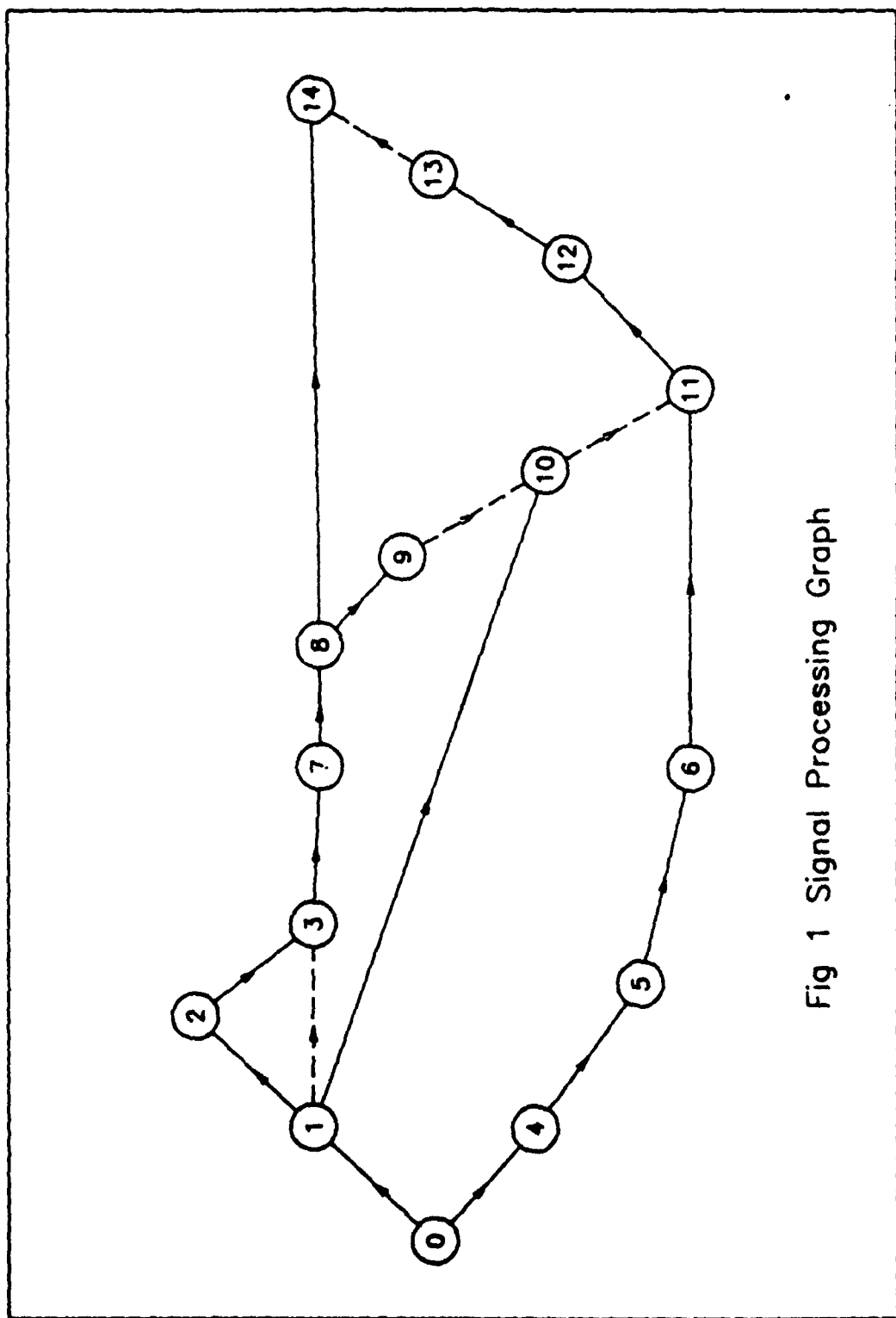


Fig 1 Signal Processing Graph

1000 - 1000 - 1000

6. The following information is provided for the year ended 31/12/2019:

DATE: 11/11/2011 TIME: 11:11 AM

[illegible]

```

POOL: NUMBER OF RESOURCES OF TYPE I
TIME: EXECUTION TIME OF RESOURCE TYPE I
TYPE: RESOURCE TYPE OF GRAPH NODE I (INPUT TYPE)
FEED: IDENTIFICATION OF RESOURCE
  FEED: GRAPH NODE BEING EXECUTED ON FEED I
  FEED: TAG OF DATA BEING EXECUTED (INFINITY IF NO DATA)
FEED: TIME WHEN PROCESS WILL FINISH (INFINITY IF FEED IS INACTIVE)
  FEED: 1 IF RESOURCE IS A MEMORY, 0 OTHERWISE
FEED: NUMBER OF INPUTS WHICH HAVE BEEN SATISFIED
  FEED: SET OF GRAPH NODES CONNECTED TO I
NODE: NUMBER OF NODES CONNECTED TO I
FREE: TIME WHEN FEED I BECOMES FREE
FEED: SET OF GRAPH NODES TO WHICH FEED I SHOULD TRANSMIT
  FEED: ELEMENT OF SET TRANS-I
LIST: SET OF RESOURCES WHICH ARE DOING SOMETHING
  FEED: NUMBER OF I/O TO GRAPH NODE I
NOW: CURRENT TIME

```

4. THE STATE OF TEXAS, County of EL PASO, do hereby certify that the foregoing is a true and correct copy of the original as the same appears in the records of the County Clerk of said County.

27. 11. 2011

1. *Chlorophyll a* and *Chlorophyll b* contents were determined by the method of Arar and Johnson (1977).

```

0001  CALL SUBROUTINE ROUTINE
0002  CALL GETTIME, HOURS, MINUTE, SECONDS, HUNDRETHS, DAYS, MONTHS, YEARS, TIME_ZONE
0003  CALL TIME_ZONE

```

```

SET TIME FOR FIRST FREQUENCY
WRITE(UNIT,*) 'GIVE TIME FOR FIRST INTERRUPT'
READ(UNIT,*) FREQ

```

THIS IS THE BEGINNING OF THE MAIN PROGRAM LOOP

END PAGE

SEE PAGE TO CHECK WHETHER SHOULD PRINT
PAGE.

```

      FREE - WHETHER ANY RESOURCE HAS COMPLETED PROCESSING AN
      OUTPUT GRAPH NODE AND SET RESOURCE FREE IF THIS IS SO
      DO NOT INFLUENT

```

```
IF INCON(RES(LIST(I),1)).EQ.0.AND.RES(LIST(I),3).LE.NOW THEN
  RES(LIST(I),1)=0
  RES(LIST(I),3)=1
```

```

1000  IF (I.EQ.1) THEN
1001    CALL GETNEXTRESOURCE (I,LIST,INDE)+1
1002    IF (I.EQ.1) THEN
1003      INDE=1
1004    ELSE
1005      INDE=INDE+1
1006    ENDIF
1007  ENDIF
1008  CONTINUE
1009  NLIST=INDE+1
1010
1011  SET I/F MORE IF IT CONTAINS NO DATA AND TIME IS CORRECT
1012  IF (INDE.NEOW.INDATA.EQ.0) THEN
1013    RES=0
1014    RES=0
1015    RES=0
1016    RES=0
1017    RES=0
1018    RES=0
1019    RES=0
1020    RES=0
1021    RES=0
1022    RES=0
1023    RES=0
1024    RES=0
1025    RES=0
1026    RES=0
1027    RES=0
1028    RES=0
1029    RES=0
1030    RES=0
1031    RES=0
1032    RES=0
1033    RES=0
1034    RES=0
1035    RES=0
1036    RES=0
1037    RES=0
1038    RES=0
1039    RES=0
1040    RES=0
1041    RES=0
1042    RES=0
1043    RES=0
1044    RES=0
1045    RES=0
1046    RES=0
1047    RES=0
1048    RES=0
1049    RES=0
1050    RES=0
1051    RES=0
1052    RES=0
1053    RES=0
1054    RES=0
1055    RES=0
1056    RES=0
1057    RES=0
1058    RES=0
1059    RES=0
1060    RES=0
1061    RES=0
1062    RES=0
1063    RES=0
1064    RES=0
1065    RES=0
1066    RES=0
1067    RES=0
1068    RES=0
1069    RES=0
1070    RES=0
1071    RES=0
1072    RES=0
1073    RES=0
1074    RES=0
1075    RES=0
1076    RES=0
1077    RES=0
1078    RES=0
1079    RES=0
1080    RES=0
1081    RES=0
1082    RES=0
1083    RES=0
1084    RES=0
1085    RES=0
1086    RES=0
1087    RES=0
1088    RES=0
1089    RES=0
1090    RES=0
1091    RES=0
1092    RES=0
1093    RES=0
1094    RES=0
1095    RES=0
1096    RES=0
1097    RES=0
1098    RES=0
1099    RES=0
1100    RES=0
1101    RES=0
1102    RES=0
1103    RES=0
1104    RES=0
1105    RES=0
1106    RES=0
1107    RES=0
1108    RES=0
1109    RES=0
1110    RES=0
1111    RES=0
1112    RES=0
1113    RES=0
1114    RES=0
1115    RES=0
1116    RES=0
1117    RES=0
1118    RES=0
1119    RES=0
1120    RES=0
1121    RES=0
1122    RES=0
1123    RES=0
1124    RES=0
1125    RES=0
1126    RES=0
1127    RES=0
1128    RES=0
1129    RES=0
1130    RES=0
1131    RES=0
1132    RES=0
1133    RES=0
1134    RES=0
1135    RES=0
1136    RES=0
1137    RES=0
1138    RES=0
1139    RES=0
1140    RES=0
1141    RES=0
1142    RES=0
1143    RES=0
1144    RES=0
1145    RES=0
1146    RES=0
1147    RES=0
1148    RES=0
1149    RES=0
1150    RES=0
1151    RES=0
1152    RES=0
1153    RES=0
1154    RES=0
1155    RES=0
1156    RES=0
1157    RES=0
1158    RES=0
1159    RES=0
1160    RES=0
1161    RES=0
1162    RES=0
1163    RES=0
1164    RES=0
1165    RES=0
1166    RES=0
1167    RES=0
1168    RES=0
1169    RES=0
1170    RES=0
1171    RES=0
1172    RES=0
1173    RES=0
1174    RES=0
1175    RES=0
1176    RES=0
1177    RES=0
1178    RES=0
1179    RES=0
1180    RES=0
1181    RES=0
1182    RES=0
1183    RES=0
1184    RES=0
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1187    RES=0
1188    RES=0
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1190    RES=0
1191    RES=0
1192    RES=0
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1195    RES=0
1196    RES=0
1197    RES=0
1198    RES=0
1199    RES=0
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1202    RES=0
1203    RES=0
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1224    RES=0
1225    RES=0
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1233    RES=0
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1237    RES=0
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1240    RES=0
1241    RES=0
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1248    RES=0
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1264    RES=0
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1280    RES=0
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1285    RES=0
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1287    RES=0
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1291    RES=0
1292    RES=0
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1297    RES=0
1298    RES=0
1299    RES=0
1300    RES=0
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1304    RES=0
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1307    RES=0
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1320    RES=0
1321    RES=0
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1326    RES=0
1327    RES=0
1328    RES=0
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1330    RES=0
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1335    RES=0
1336    RES=0
1337    RES=0
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1340    RES=0
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1342    RES=0
1343    RES=0
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1345    RES=0
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1348    RES=0
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1350    RES=0
1351    RES=0
1352    RES=0
1353    RES=0
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1355    RES=0
1356    RES=0
1357    RES=0
1358    RES=0
1359    RES=0
1360    RES=0
1361    RES=0
1362    RES=0
1363    RES=0
1364    RES=0
1365    RES=0
1366    RES=0
1367    RES=0
1368    RES=0
1369    RES=0
1370    RES=0
1371    RES=0
1372    RES=0
1373    RES=0
1374    RES=0
1375    RES=0
1376    RES=0
1377    RES=0
1378    RES=0
1379    RES=0
1380    RES=0
1381    RES=0
1382    RES=0
1383    RES=0
1384    RES=0
1385    RES=0
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1387    RES=0
1388    RES=0
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1391    RES=0
1392    RES=0
1393    RES=0
1394    RES=0
1395    RES=0
1396    RES=0
1397    RES=0
1398    RES=0
1399    RES=0
1400    RES=0
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1402    RES=0
1403    RES=0
1404    RES=0
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1409    RES=0
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1413    RES=0
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1415    RES=0
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1424    RES=0
1425    RES=0
1426    RES=0
1427    RES=0
1428    RES=0
1429    RES=0
1430    RES=0
1431    RES=0
1432    RES=0
1433    RES=0
1434    RES=0
1435    RES=0
1436    RES=0
1437    RES=0
1438    RES=0
1439    RES=0
1440    RES=0
1441    RES=0
1442    RES=0
1443    RES=0
1444    RES=0
1445    RES=0
1446    RES=0
1447    RES=0
1448    RES=0
1449    RES
```

SOURCE-GRAPH NODE CONNECTED TO SOURCE
 TO WHICH TRANSMISSION IS NECESSARY
 DE TO LIST TRANS LIST (1,1)

EXAMINE EACH GRAPH NODE CONNECTED TO SOURCE
 TO WHICH TRANSMISSION IS NECESSARY
 DE TO LIST TRANS LIST (1,1)

SET ADDITIONAL RESOURCE
 IRES=1
 SIN GRAPH NODE OR RECEIVER OF INFORMATION
 SIN TRANS LIST (1,1)

TEST 1 IF TRANSMISSION TO SINK IS POSSIBLE
 20 OTHERWISE
 TEST 1

CHECK FOR PRIORITY 1 IF
 10 ADD RESOURCE, SIN, SINK, THEN

IF PRIORITY 1 IF THEN NEW RESOURCE REQUIRED SO
 CHECK ACTIVE RESOURCE ALLOCATION
 IF POOL FREE (SINK, SINK, SINK) TESTED

ELSE

IF NOT PRIORITY 1 IF CHECK FOR ACTIVE RESOURCE
 EXECUTING CORRECT GRAPH NODE AND TIME TAG
 CALL OTHERWISE, IRES, TEST, LIST (1,1), SIN, INRATED

ENDIF

TRANSMIT IF POSSIBLE
 IF TEST, ED, 1 THEN
 CALL XMIT (NRES, IRES, NOW, IRES, SIN, LIST (1,1), INF, TTIME,
 NLIST
 SET PRINT FLAG
 PRINT=1
 ENDIF

CONTINUE

ELIMINATE TRANSFERS THAT HAVE OCCURRED FROM LIST TRANS
 INDEX=0

DO WHILE TRANS LIST (1,1)
 IF TRANS LIST (1,1) .NE. 0 THEN
 INDEX=INDEX+1
 TRANS LIST (1,1) INDEX TRANS LIST (1,1)
 ENDIF

CONTINUE
 NTRANS LIST (1,1)=INDEX

TRANSMIT TO GLOBAL MEMORY IF RESOURCE IS NOT ALREADY
 A MEMORY AND THERE ARE STILL TRANSFERS TO MAKE

IF (INDEX, GT, 0 AND, RES, LIST (1,1), ED, 0) THEN
 CALL XMIT (NRES, IRES, NOW, IRES, SOURCE, LIST (1,1),
 MTYPE, NOUT, TTIME, NLIST, TEST)
 SET PRINT FLAG
 PRINT=1
 ENDIF

SET RESOURCE AS FREE AND INCREMENT RESOURCE POOL
 IF RESOURCE WAS NOT A MEMORY OR IF THERE ARE NO

[illegible]

```

REMOVE THE TIME RESOURCES FROM LIST
INDEX = 1
DO WHILE (INDEX <= LIST(0))
    IF LIST(0,LINE,INFO) THEN
        INDEX = INDEX + 1
        LIST(INDEX) = LIST(0)
    ENDIF
CONTINUE
DELIST = INDEX

```

5. 11. 2000

[illegible]

```

DI-PLAY SYSTEM STATUS
IF PRINTED 11 CALL STATUS(NOUT,NOW,NRES,STYPE,INF,NBUS,NLIST,PFLAG)

```

[illegible]

—

1. The first step in the process is to identify the problem or issue that needs to be addressed. This involves gathering information and understanding the context of the problem.

STATEMENT FOR AREA DIMENSIONS
 LENGTH = 10.75, WIDTH = 5.75

```
COMMON /F1/ M3(C:N1,C:N1),F00L(N2),EXTIME(N2,TYPE(C:N1),BFFREE(N2),
+FEF :N3,5),COMM:N1,N1),NCORN(C:N1),NIP(N1),TRAN2(C:N4,N1+1),
+TIME = 1999,IST(N4+1),F011(100,2)
```

```

10 10 I=1,NODES
      NCONN(I)=0
      DO 11 J=1,NODES
        IF (A00(I,J).NE.0) THEN
          NCONN(I)=NCONN(I)+1
          CONN(I,NCONN(I))=J
        ENDIF
      11 CONTINUE
    10 CONTINUE
  END

```

1 CONTINUE

... ..

—

PARAMETER ESTIMATION FOR THE DIMENSIONAL
PARAMETER ESTIMATION FOR THE DIMENSIONAL

[illegible]

1. The first step in the process is to identify the problem or issue that needs to be addressed. This involves gathering information and understanding the context of the problem.

[illegible]

```
WRITE (INOUT,*)  
WRITE (INOUT,*) RESOURCES = RESID  
WRITE (INOUT,110) (FOOL(I),I=0,NTYPE)
```

[illegible]

RE: THE ABOVE NAMED SUBJECTS, AND THE FACTS AND CIRCUMSTANCES SURROUNDING THE SAME.

4-15-1967, 11:00 AM. The following information was obtained from the above mentioned source:

227: 5.

10. FORMATS: 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 8

245

1. OUTLINE OF THE INDEX
 2. INDEX OF THE INDEX

GEOMETRIC STATEMENT FOR AREA DIMENSIONS
GEOMETRIC STATEMENT FOR AREA DIMENSIONS

~~COMMON (2) POLYMERIZATION (1) POLYMERIZATION TIME (1) TYPE (1) FREE (1)
-SEE Q-13.5. CONTINUED (1) POLYMERIZATION TIME (1) TRANS (1) Q-13.5.1~~

1. The first step is to identify the problem. In this case, the problem is that the system is not working properly.

```

DO 10 I=1,NBUS+1,1
WRITE (10,*) 'HOW MANY BUSES DO YOU WANT'
READ (10,*) NBUS
IF (NBUS.GT.1) THEN
  DO 20 I=NBUS+1,NBUS+1
    BUTL(I,1)=0
    BUTL(I,2)=0
    FREE(I)=0
  END DO
END DO

```

THE NUMBER OF SUSPENSE TO NEW VALUE
OF THE NEWS

ALL INFORMATION CONTAINED HEREIN

THEY WERE TOLD TO GO TO THE
MILITARY COURT, AND TO GO TO THE
MILITARY COURT, AND TO GO TO THE
MILITARY COURT.

$$A \cdot B = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} \cdot \begin{pmatrix} 5 & 6 \\ 7 & 8 \end{pmatrix} = \begin{pmatrix} 17 & 26 \\ 25 & 32 \end{pmatrix}$$

31 70 10

61

NO
DATE